Dropping In a Microgravity Environment

2001/2002
for student teams
in Illinois, Indiana,
Michigan, Minnesota,
Ohio, and Wisconsin

Program Announcement

DIME is a NASA educational program for teams of high-school-aged students to design and build a science experiment to be tested in a NASA microgravity drop tower.

DIME 2001 teams at the 2.2 Second Drop Tower

National Aeronautics and
Space Administration
Glenn Research Center

WHAT IS DIME?

The NASA Dropping In a Microgravity Environment (DIME) is a wonderful opportunity for students to experience the process of cooperative scientific research from start to finish. Student teams develop a hypothesis that can be tested through experimentation and then submit a scientific research proposal. A panel of NASA scientists and engineers evaluate the proposals and select up to six of the best proposals.

If selected, the student team will design and construct their science experiment within the DIME guidelines for operation in a NASA microgravity drop tower. Four student team members and one adult advisor from each selected team win an expense-paid trip to NASA Glenn Research Center in Cleveland, Ohio during Drop Days. The team members will assist in the operation of their experiment in the drop tower and participate in workshops, tours and other educational activities. After Drop Days, a final report is prepared by each selected team.

The second annual DIME competition will occur during the 2001/2002 school year with participation open to teams of students in grades 9 to 12 located in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.

Further information is available on the WWW at
`http://microgravity.grc.nasa.gov/DIME.html`

Questions and Comments

This brochure contains all necessary information for submitting entries to the 2001/2002 DIME competition. If you still have questions after reviewing these resources, please contact us at this address.

NCMR / DIME
NASA GRC, MS 110–3
21000 Brookpark Road
Cleveland, OH 44135
E-mail: `DIME@grc.nasa.gov`
Fax: 216-433-3793

DIME 2001 team prepares their drop tower experiment

Learning Goals Aligned With National Education Standards

The DIME program supports specific national standards in science and technology. Participation in DIME will contribute to student mastery of these standards:

National Science Teachers Association Standards

- Science as inquiry
  - + Abilities necessary to do scientific inquiry
- Science and technology
  - + Abilities of technological design

International Technology Education Association Standards

- Design
  - + Students will develop an understanding of the attributes of design

Key Dates

November 20, 2001	Deadline for mailing proposal to NASA GRC
by January 4, 2002	Selected teams announced
April 1, 2002	Delivery of experiment package to NASA
week of April 22, 2002	Drop Days at NASA
June 3, 2002	Deadline for mailing final report to NASA

DIME OVERVIEW

MICROGRAVITY is a condition in which the effects of gravity are greatly reduced compared to those experienced on Earth. The microgravity condition is easily created by a free fall within a gravitational field. Refer to the DIME Educators Resource Guide for more information on microgravity.

Getting Started

This DIME Announcement includes the core details needed to enter the competition. Information for guidance on selecting an experiment topic is contained in the DIME Educators Resource Guide. Requirements for design of the experiment are contained in the DIME Experiment Design Requirements document. Both are available from the DIME web site.

The DIME web site also offers additional information related to microgravity and classroom activities.

Select an effect of gravity that will be reduced in a microgravity environment and will be observable and measurable in 2.2 seconds of microgravity.

DIME fundamentals

When done methodically, developing a microgravity experiment need not be daunting. The following is the sequence of steps in a successful DIME entry:

1. Select an experiment.
2. Conduct normal gravity research related to your experiment.
3. Develop a proposal as explained on page 3.
4. Submit proposal as detailed on page 4.
5. Upon selection by NASA, design the proposed experiment, following guidelines in the DIME Experiment Design Requirements document.
6. The selected teams will be assigned a NASA mentor who will provide guidance and support as the team continues through the process of designing and fabricating the experiment apparatus.
7. Submit Preliminary Design to NASA for review.
8. After approval, construct the experiment.
9. Submit final safety documents.
10. Ship experiment to NASA.
11. Participate in Drop Days at NASA.
12. Submit final written report.

DIME Schedule

When preparing your proposal, observe the key dates listed on page 1, in particular, the proposal submission postmark date. Proposal receipt confirmation will be sent to each team.

Please make certain that your team representatives will be available to participate in DIME Drop Days in April 2002.

Evaluation

All entries will be evaluated by a team of scientists, engineers, and educators according to the selection criteria published in this announcement. Up to six proposals will be selected for further development of their experiment. Both selected and non-selected teams will be notified of the results.

DIME Drop Days

NASA Glenn trip

From each of the selected teams, four student representatives and one adult advisor win travel and room/board for a three-day trip to NASA Glenn in Cleveland, Ohio, for the DIME Drop Days in April. All individuals coming to NASA will be required to provide verification of their U.S. citizenship or legal U.S. residency.

Team members at school during Drop Days

The remainder of the team at their home locale will be able to connect to the Internet and monitor the experiment drop activities of the teams during Drop Days at NASA Glenn Research Center.

Final Report

Following DIME Drop Days, each selected team will be required to prepare a final report and submit it to NASA.

DIME 2001 team members measuring liquid to prepare their experiment for a drop

DIME PROPOSAL PREPARATION

Proposal Components

In order to be selected to build and drop an experiment, teams must demonstrate that the student members of the team understand the scientific principles involved in their proposal. They need to be prepared to design and build the experimental apparatus in time for Drop Days. The team will submit a proposal containing the five sections listed below. Sections I-III are limited to a total of 1500 words.

I. Scientific Objectives

A. Describe briefly and clearly the research question you hope to answer.

B. Explain why microgravity is important to this experiment.

C. Include a hypothesis that can be tested in 2.2 seconds of microgravity.

D. Describe the procedures that will be used to observe, measure and interpret the results.

E. Describe the purpose and potential benefits from this experiment and address practical applications of the work.

II. Technical Plan

A. Give a clear, detailed description of the experimental apparatus to be used and any hardware to be built.

B. Describe the expected sequence of events during the operation of the experiment. Explain how it will answer your research question.

C. Explain the design features that will allow the experiment to survive impact, be usable for another possible drop, and collect appropriate data in 2.2 seconds.

D. Describe ground testing prior to reduced-gravity testing.

E. Be sure the design meets the safety and design requirements as specified in the DIME Experiment Design Requirements document (available from the DIME web site).

F. Scrupulous attention to the DIME Competition Rules suggests that teams will be able to meet all the requirements for a safe and successful operation.

G. Show that you are ready to provide the experimental materials on schedule and that your design can provide useful data.

III. Team Organization

Because experiment design, development, and operation is a team effort at NASA, this competition is designed to involve teamwork. In particular, teams should include students able to perform the following kinds of tasks:

- Planning and coordinating work
- Designing experiments
- Building experimental apparatus
- Conducting experiments
- Communicating the plans and results of the project

In your proposal, include the following material:

A. Describe how your team is prepared to carry out the proposed experiment, including the researching of the topic and writing of the final report.

B. Describe the variety of skills individual members bring to the team.

C. Explain how your team will share an appropriate distribution of workload and responsibilities.

IV. Resource Credits

List all referenced books, periodicals, and web sites following a standard style, such as American Psychological Association (APA). Note that this section is not included in the word count.

V. Figures

This section may contain up to five single-sided pages of figures or drawings. The figures must be numbered in sequence and referenced from the text. The caption text must be in the font specified for the proposal text.

Evaluation Criteria

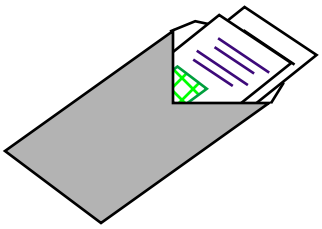
The proposal will be evaluated using a rubric with total points assigned in the following way:

- Scientific Objectives 35
- Technical Plan 35
- Team Organization 10
- Creativity, Attention to Detail, Grammar, and Originality 10
- Resources 10

Proposal Format Requirements

1. The proposal must be typed or computer-printed, double-spaced, using 12-point Times font, not bold or italic, and left justified. A 1-inch margin should be used for all sides of the pages. Portrait format shall be used for the pages. Leave $1\frac{1}{2}$ inches blank at the top of the first page for a DIME evaluation label.
2. The proposal must be stapled in the upper left corner.
3. The proposal may not have a title page, folder or covers.
4. The proposal must have a title which must not exceed 60 characters in length including spaces. The title should be placed at the top of the first page.
5. Student names, advisor name(s), or any information that would identify the team, associated school or organization, or their location must not appear anywhere in the proposal. This will help ensure unbiased evaluation by the evaluators.

DIME COMPETITION RULES



1. A DIME entry comprises an Entry Form (pages A and B), an Entry Checklist Form, a self-addressed, stamped #10 envelope, and five identical and complete copies of the proposal, all in a single package.
2. The DIME entry must be postmarked by the date given on page 1 and addressed to:

   NCMR / DIME Proposal
   NASA GRC, MS 110–3
   21000 Brookpark Road
   Cleveland, OH 44135
3. So we may send confirmation that your entry package was received, include a self-addressed, stamped #10 envelope in your entry package.
4. Late entries, entries sent by facsimile or electronic mail, and entries not complying with competition rules will be disqualified.
5. Entry materials will not be returned; retain a copy for your records.
6. All evaluators' decisions are final.
7. Proposals must follow preparation guidelines and format requirements as listed on page 3.
8. Team members must be students in grades 9 to 12.
9. The team member roster may contain only one student who has attended DIME Drop Days at NASA Glenn.
10. The DIME competition for the 2001/2002 school year is open to teams located in Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin.
11. Four student team representatives and one adult advisor from each selected team will attend DIME Drop Days at NASA Glenn

DIME 2001 team and their mentor examine the data after a drop

DIME Entry Form

Dropping In a Microgravity Environment

Page A

Proposal title

_____

Grade level(s) of team members (circle all that apply):
9 10 11 12

Proposal summary (maximum 50 words)

_____

_____

_____

Student Team Member Information

Total number of student team members submitting this proposal: _____

Teams may include more than four student team members to ensure that necessary skills are represented on the team, although, only up to four student representatives and one adult advisor will travel to NASA Glenn Research Center in Cleveland, Ohio for participation in DIME Drop Days.

	TEAM MEMBER NAME	SIGNATURE
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____
8	_____	_____

For additional team members, attach a list of students' names and signatures and indicate here the number of additional pages of students' names and signatures. ____

DIME Entry Form

Dropping In a Microgravity Environment

Page B

Proposal title

_____

Advisor Information

Lead advisor name: _____

Additional advisor name: _____

Additional advisor name: _____

School or sponsoring organization: _____

Address:

_____

_____

City _____ State _____ ZIP _____ – _____

Telephone number (_____ – _____ – _____) Fax number (_____ – _____ – _____)

Lead advisor's e-mail address _____

School/organization WWW address:

http:// _____

_____

We affirm that this team proposal for the DIME is original and has been independently conceived and developed by the student members of the team. We further affirm that we have read and understand the rules of the DIME competition. We understand that entries are the property of NASA and may be used for publicity or outreach purposes. Copyrighted materials are properly identified and cited and permission has been obtained for their use.

Lead advisor's signature: _____

Date: _____

Dropping In a Microgravity Environment

Entry Checklist Form

Proposal title

Mark each item as you prepare your package. ✓
This completed Entry Checklist Form must accompany each entry.
Failure to follow instructions will result in disqualification.

Team Checklist

Entry Form (pages A & B)

- O We have completed the Entry Form in only blue or black ink.
- O We have indicated the grade levels for our team members.
- O We have placed the proposal title identically on all entry components.
- O We have provided a proposal summary on Entry Form page A.
- O We have legibly listed the name of each team member.
- O We have signed the Entry Form on the line provided beside our name.

DIME Proposal

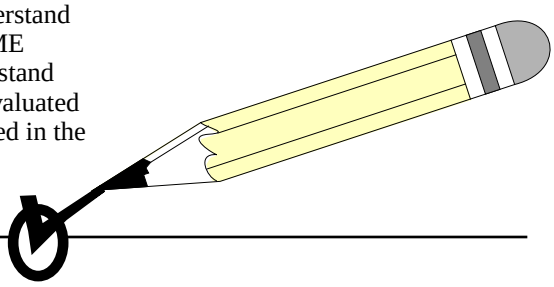
- O The proposal **does not have** school, city, state, student, teacher, advisor, parent names, sponsoring organization or any identifying information on it anywhere.
- O It does not have a title page, folder, or other covers.
- O We are submitting print material in portrait format on 8 ½ by 11 inch paper in 12 point Times font, double-spaced plain (not bold or italic), left-justified type for the body.
- O One inch margins are used for all pages.
- O We have left 1½ inches of paper blank at the top of the first page of our proposal.
- O A title is on the top of the first page and contains 60 characters or less, including spaces.
- O We have kept a copy of our proposal and understand that our proposal will not be returned.
- O We have had someone else proofread our proposal for typing mistakes, misspellings, and incomplete sentences.

Evaluation

- O We have read and understand the criteria for the DIME competition and understand our proposal will be evaluated against the criteria listed in the DIME Program Announcement.

Assembly of Entry

- O We stapled each of the five copies of our proposal in the upper left corner.
- O We have placed the following entry components in a single envelope: (1) our Entry Form (pages A & B), (2) completed Entry Checklist Form, (3) a SASE, and (4) five copies of the proposal.



Advisor Checklist

- O I have signed and dated the Entry Form on page B.
- O Advisor information is accurate and complete.
- O This proposal has been proofread.
- O If mailing entries from multiple teams, my advisor information is listed identically on each Entry Form and each team entry is placed in its own envelope.
- O Copyrighted material has been properly identified and cited and permission has been obtained, where necessary, for its use.

Lead advisor signature:	
Date:	

Acknowledgements

The Dropping In a Microgravity Environment (DIME) program is a cooperative effort of many organizations.

- Microgravity Science Division at NASA Glenn Research Center, Cleveland, Ohio
- National Center for Microgravity Research on Fluids and Combustion at NASA Glenn Research Center, Cleveland, Ohio
- Microgravity Research Program Office at NASA Marshall Space Flight Center, Huntsville, Alabama
- Office of Biological and Physical Research at NASA Headquarters, Washington DC
- Office of Human Resources & Education at NASA Headquarters, Washington DC

The DIME program is carried out by personnel in the Microgravity Science Division and the National Center for Microgravity Research on Fluids and Combustion. Critical support also comes from the staff of the 2.2 Second Drop Tower facility and the Imaging Technology Center.

NOTE:
Use of commercial names and products does not imply an endorsement by NASA.

Documents and other information related to the DIME program may be accessed at the following World Wide Web address:

`http://microgravity.grc.nasa.gov/DIME.html`